

Notice of Allowability

Application No.

10/650,857

Examiner

LEE NGUYEN

Applicant(s)

HWANG ET AL.

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☐ This communication is responsive to ____.
2. ☒ The allowed claim(s) is/are 1-16.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some* c) ☐ None of the:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: ____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date ____.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date ____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date ____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date ____
7. ☐ Examiner's Amendment/Comment
8. ☐ Examiner's Statement of Reasons for Allowance
9. ☐ Other ____.

Allowable Subject Matter

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

The IDS filed 8/29/2003 and 12/16/2005 have been considered and recorded in the file.

Claims 1-16 are allowed.

Regarding claim 1, Medvedev et al. (US 2005/0094598) teaches transmitting the best SNR values derived from a transmission channel at the receiver and feedback to the transmitter for conditioning at the transmitter (see para [0140]). Khalighi et al. (IEEE, submitted by Applicant) teaches water filling including Singular Value Decomposition for use at multiple input multiple outputs (MIMO), see entire document. However, the prior art of record fails to teach or suggest: a water filling unit, which does not perform water filling for a training signal that is pre-known by the receiving apparatuses, and performs water filling for a user signal to be transmitted, the water filling being performed using the V matrix and predetermined control values, and a control value detector, which extracts the control values from signals received from the receiving apparatuses through the multi-antennas, and outputs a maximum value among the extracted values to the water filling unit.

Regarding claim 3, Medvedev et al. (US 2005/0094598) teaches transmitting the best SNR values derived from a transmission channel at the receiver and feedback to the transmitter for conditioning at the transmitter (see para [0140]). Khalighi et al. (IEEE, submitted by Applicant) teaches water filling including Singular Value Decomposition for use at multiple input multiple outputs (MIMO), see entire document. However, the prior art of record fails to teach or suggest: a channel estimation and $U^{sup.H}$ generator, which estimates a state of a channel through which a training signal has been passed, and processes the estimated channel state information to generate matrices including a receiving side unitary matrix $U^{sup.H}$ for the channel if the training signal is pre-known by the transmitting apparatus, and an effective-signal-to-noise-ratio (ESNR) calculator, which calculates an ESNR from noise detected during the decoding and the matrices, except the $U^{sup.H}$, and outputs the ESNR to the transmitting apparatus through the multi-antennas if the signal received through the multi-antennas is the training signal that is pre-known by the transmitting apparatus.

Regarding claim 6, the claim is allowable for the same reason as set forth in claims 1 and 3.

Regarding claim 7, Medvedev et al. (US 2005/0094598) teaches transmitting the best SNR values derived from a transmission channel at the receiver and

feedback to the transmitter for conditioning at the transmitter (see para [0140]).

Khalighi et al. (IEEE, submitted by Applicant) teaches water filling including Singular Value Decomposition for use at multiple input multiple outputs (MIMO), see entire document. However, the prior art of record fails to teach or suggest:

(b) operating the V matrix with a training signal that is pre-known by the signal receiving apparatuses and transmitting the operated result through the multi-antennas; (c) receiving signals from the respective receiving apparatuses, extracting predetermined control values included in the received signals, and selecting a receiving apparatus having an optimal state for the channel by comparing the extracted control values; and (d) transmitting a user signal to the selected receiving apparatus through the multi-antennas.

Regarding claim 10, Medvedev et al. (US 2005/0094598) teaches transmitting the best SNR values derived from a transmission channel at the receiver and feedback to the transmitter for conditioning at the transmitter (see para [0140]).

Khalighi et al. (IEEE, submitted by Applicant) teaches water filling including Singular Value Decomposition for use at multiple input multiple outputs (MIMO), see entire document. However, the prior art of record fails to teach or suggest:

(c) decoding by multiplying the receiving side unitary matrix by the training signal; and (d) calculating an effective-signal-to-noise-ratio (ESNR) using noise detected during the decoding and the matrices generated at (b), except the receiving side unitary matrix, and transmitting the calculated ESNR to the transmitting

apparatus.


Regarding claim 13, Medvedev et al. (US 2005/0094598) teaches transmitting the best SNR values derived from a transmission channel at the receiver and feedback to the transmitter for conditioning at the transmitter (see para [0140]). Khalighi et al. (IEEE, submitted by Applicant) teaches water filling including Singular Value Decomposition for use at multiple input multiple outputs (MIMO), see entire document. However, the prior art of record fails to teach or suggest: (e) decoding by multiplying the receiving side unitary matrix for the channel by the training signal; (f) calculating an effective-signal-to-noise-ratio (ESNR) using noise detected during the decoding and the matrices generated at (d), except the receiving side unitary matrix, and transmitting the calculated ESNR to the transmitting apparatus; and (g) the transmitting apparatus extracting the ESNRs from signals received from the receiving apparatuses, selecting a receiving apparatus having an optimal state for the channel by using the extracted ESNR values, and transmitting a user signal to the selected receiving apparatus through the multi-antennas.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LEE NGUYEN whose telephone number is 571-272-7854. The examiner can normally be reached on FIRST FRIDAY OFF.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, ANDERSON D. MATTHEW can be reached on 571-272-4177. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


LEE NGUYEN
PRIMARY EXAMINER